

CLAIMS

1. A sorption concentrator for removing contaminants from a gas stream, comprising:

a plurality of adjacent generally rectangular sorption units;

5 a gas flow system directing gas to be cleaned through a majority of said plurality of sorption units during a sorption cycle and directing a separate clean gas stream through the remaining sorption units during a desorb cycle;

10 said plurality of adjacent sorption units each including a semi-conductive foil substrate having convoluted surfaces and channels extending generally parallel to a direction of flow of said gas to be cleaned during said sorption cycle and said clean gas stream during said desorption cycle coated with a sorption material; and

15 a source of electrical current connected to said semi-conductive foil substrate rapidly resistively heating said remaining sorption units during said desorption cycle.

2. The sorption concentrator as defined in Claim 1, wherein said semi-conductive foil substrate is formed of aluminum foil.

3. The sorption concentrator as defined in Claim 2, wherein said aluminum 20 foil substrate has a thickness between 0.005 mm and 2 mm.

4. The sorption concentrator as defined in Claim 1, wherein said aluminum foil substrate has a thickness of between 0.005 mm and 2 mm.

25 5. The sorption concentrator as defined in Claim 2, wherein said aluminum foil substrate has a thickness of between 0.05 mm and 1 mm.

6. The sorption concentrator as defined in Claim 2, wherein said aluminum foil substrate has a thickness of between 0.1 mm to and 0.3 mm.

30 7. The sorption concentrator as defined in Claim 1, wherein said semi-conductive foil substrate comprises a honeycomb formed of a plurality of generally

parallel corrugated semi-conductive foil sheets each affixed in electrical contact to a generally planar semi-conductive base sheet and coated with a sorption material.

8. The sorption concentrator as defined in Claim 1, wherein said semi-conductive foil substrate comprises a plurality of parallel tubes in electrical contact formed of a semi-conductive foil coated with a sorption material extending parallel to said direction of flow of said gas to be cleaned during said sorption cycle and parallel to said clean gas stream during said desorb cycle.

10 9. The sorption concentrator as defined in Claim 1, wherein said sorption material is selected from the group consisting of activated carbon, zeolite and porous polymers bonded to said semi-conductive foil substrate.

15 10. A rotary concentrator, comprising:  
a rotating frame for mounting a plurality of sorption units having a rotational cycle;

20 a plurality of adjacent sorption units mounted on said frame;  
a gas flow system directing gas to be cleaned through a majority of said rotational of said frame during a sorption cycle and directing a separate clean desorb gas over a smaller percentage of the rotational cycle of said frame during a desorb cycle;

25 each of said sorption units including an aluminum foil substrate having convoluted surfaces and channels extending generally parallel to a direction of flow of said dirty gas to be cleaned during said sorption cycle and said clean desorb gas during said desorb cycle and said aluminum foil substrate coated with a sorption material; and  
a source of electrical current connected to said aluminum foil substrate resistively heating said aluminum foil substrate during said desorb cycle.

30 11. The rotary sorption concentrator as defined in Claim 10, wherein said aluminum foil substrate has a thickness of between 0.005 mm and 2 mm.

12. The rotary sorption concentrator as defined in Claim 10, wherein said aluminum foil substrate has a thickness of between 0.05 mm and 1 mm.

5 13. The rotary sorption concentrator as defined in Claim 10, wherein said aluminum foil substrate has a thickness of between 0.1 mm and 0.3 mm.

10 14. The rotary sorption concentrator as defined in Claim 10, wherein said aluminum foil substrate comprises a honeycomb formed of a plurality of parallel corrugated aluminum foil sheets each affixed in electrical contact to a generally planar base sheet and said sheets coated with said sorption material.

15 15. The rotary sorption concentrator as defined in Claim 14, wherein said corrugated aluminum foil sheets affixed to said planar aluminum foil sheets are stacked in parallel relation and electrical contact and enclosed in a generally rectangular housing having open ends defining said sorption units.

20 16. The rotary sorption concentrator as defined in Claim 10, wherein said aluminum foil substrate comprises a plurality of aluminum tubes affixed together in electrical contact extending generally parallel to the direction of said dirty gas flow during said sorption cycle and said clean desorb gas during said desorption cycle.

25 17. The rotary sorption concentrator as defined in Claim 10, wherein said sorption material is selected from the group consisting of activated carbon, zeolite and porous polymers affixed to said aluminum foil substrate by a binder.

18. The rotary concentrator as defined in Claim 10, wherein said aluminum foil substrate comprises a plurality of nested regular polygonal aluminum tubes having planar surfaces and electrical contact and bonded together to form a honeycomb.